

F. Dating Methods and Related Deductions in the Niah Great Caves

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METHODS OF DATING EMPLOYED AT NIAH

A. *With positive results to date*—so that they specifically assist phase detection (brackets give approximate phase-band in years, estimated accuracy).

a. *All horizons to 50,000 years*

1. Carbon 14—(75 to 1,000, years varying).
2. Molluscan food shells—statistical analysis of quantities, especially relative numbers of *Bellamaya* and *Neritina* (5,000).
3. Stone tool types and materials—especially volcanic rocks (2,000—20,000).
4. *Manis palæo-javanica*, the Giant Pangolin (either above or below 25,000; Dr D. A. Hooijer, 'The giant extinct pangolin', *SMJ*, 9 (N.S. 15-16, 350-355).
5. Fossil oysters—definite layer in low-lying caves (at ? 15,000 years).
6. 'Fossil guano'—new data, mid-1961 (and previous studies, Dr G. Wilford).
7. Cave bat fauna—statistical bone analysis of changes (Earl of Cranbrook, continuing).
8. Trace elements—separate paper elsewhere in Congress (Dr Bruno E. Sabels, 'Climatic variations in the Tropical Pacific as evidenced by trace element analysis', in *Pleistocene and Post-Pleistocene Climatic Variations in the Pacific Area: II*).
9. Soil analysis—paper by Dr C. D. Sutton ('Some chemical analysis data from Niah Caves', *SMJ*, 9 (N.S. 15-16, 382-388).

b. *Upper horizons only*

10. Stonewares (typology)—Chinese and Siamese imported wares (all between A.D. 600 and 1,300).
11. Bead typology—evolution from bone to glass and imported (study continuing with Dr Alastair Lamb, University of Malaya).
12. Recently extinct fauna—tapir, tiger, elephant, wild buffalo, tiny domestic dog (study continuing with Dr D. A. Hooijer, Leiden).

B. *With negative results to date.*

c. *Human and artifact*

13. Earthenware pottery—Neolithic onwards; sequences not yet certain (cf. Dr Solheim, in press).

14. Bone tools—sequential differences still unclear (Lord Medway's study with T. H. continuing; to be completed 1962.)
15. Human dentitions—study continuing (Dr Yim Khai Sun) and report on deep skull by Dr Brothwell of Cambridge ('Upper Pleistocene Human skull from Niah Caves', *SMJ*, 9 (N.S. 15-16, 323-349).

d. Chemical, etc.

16. Fluorine in bone—(material with Dr Kenneth Oakley, British Museum).
17. Pollen analyses—show progress but owing to lack of comparative dated material from outside cave still negative; mangrove phases marked now (Dr Shutler now doing new study in Nevada).
18. Volcanic ash—far inside cave in stratification (Shell Company co-operation).
19. Soil and mud overburdens on basic strata—magnetometer depth measurements (projected through Shell Company).
20. Potassium argon—in prospect?
21. Micro fauna in limestone—Dr Adams of British Museum has been studying—probably no application to human times?

NOTE

Difficulties of dating below 50,000 years are much increased as at Niah nothing fossilizes. Shells disintegrate *c.* 40,000 and bone (except bat and some fish) normally at *c.* 50,000 years. Further ideas and aid needed here—and all through.